Control Measure Summary: Revise Subchapter 19 emission limits for simple cycle turbines	**Emissions (tons/yr) in New Jersey**		**Comments**
2002/2009 existing measures: Peaking units are generally defined as electric generating units which operate only during the peak energy demand. Peaking units operate during the hot summer days and generally operate for less than 500 hours per year and less than 10 hours per day; or less than 10% annual capacity factor. Existing peaking units are mostly simple cycle frame or aeroderivative turbines. Most existing peaking units do not have any NOx control device.	NOx in 2002: SOx in 2002: PM in 2002:	4860 N/A N/A	**The Department should provide further details on the source(s) and assumptions used for the NOx, SOx, and PM emission data so that more detailed comments can be provided. As presented, there is insufficient background information to assess the accuracy of the emission inventory or the appropriateness of the assumptions. PSEG Fossil believes that an accurate emission inventory is critical to the development of appropriate and effective control strategies.**
Candidate measure 1: Install water injection technology (short term) Measure ID: Water Injection Emission Reductions: EPA estimates a 55% reduction in NOx emissions. Control Cost: Reductions can be achieved at a reasonable initial cost, but due to low annual capacity utilization, the incremental cost is approximately $44,000 per ton of mostly ozone day NOx reduction, equivalent to about $4400 per ton for calendar year reductions. Dividing by a factor of 10 approximates the cost effectiveness of continuous operation, assuming 36 days per year of ozone season operation. Note that annualized $/ton is not an appropriate cost effectiveness metric for peaking units used disproportionately on high ozone days. More appropriate metrics are the capital cost of control compared to the capital cost of the unit in $/MW, and the operating cost compared to the price of electricity in $/MW-hr. The cost of retrofitting a 25 MW turbine with water injection technology is less than $40,000 per MW compared to about $600,000 per MW cost of the turbine. The cost of operating water injection is about ___ $/MW-hr. During the peak energy demand, the market price of electricity is over $700 per MW-hr, compa Timing of Implementation: Assume full implementation by 2009. Implementation Area: Entire State.	NOx 2009 Reduction: 2009 Remaining: SO2 2009 Reduction: 2009 Remaining: PM 2009 Reduction: 2009 Remaining:	2673 2187 N/A N/A N/A N/A	**The cited cost-effectiveness value of $44,000/ton for water injection was provided to the Department in 2005 during the Stationary Combustion Source Workgroup process by a single company for a water injection installation at one of that company's sites. The Department should not consider this unique, site-specific cost estimate to represent the cost-effectiveness of retrofitting water injection on all units. The Stationary Combustion Source Workgroup's 10/31/05 report entitled, "A Collaborative Report Presenting Air Quality Strategies for Further Consideration by the State of New Jersey" correctly states that "the costs for implementing such a strategy [i.e. water injection] can vary significantly based on a turbine's baseline NOx emissions, utilization level, and other site-specific factors such as existing DM water storage capacity." Water injection may be cost-effective at some sites, but it will not be cost-effective at others.** **The Department did not provide sufficient justification to support dividing annualized cost-effectiveness values by a factor of 10 to approximate the cost-effectiveness on an "ozone season day" basis. The Department's underlying assumption of 36 days per year of ozone season operation seems arbitrary and without technical basis. If the Department wishes to shift the criteria for evaluating the cost-effectiveness of control technologies from the traditional "annual" basis to an "ozone season day" basis, then it should utilize a more technically sound and justifiable method of estimating these costs. The Department should also consider that source owners must incur the full capital costs of emission control technologies, and a substantial portion of the operating and maintenance (O&M) costs, regardless of how much a source operates. Many peaking units have extremely low operating hours, and in New Jersey's deregulated energy marketplace, owners do not have the ability to recover these costs.** **It is unclear whether the Department intends to set a single, performance-based NOx emission standard (e.g. lb/MMBtu) determined to be achievable based on the use of water injection, or simply require the installation of water injection and allow the NOx emission limits for individual units to be established on a case-by-case basis. Setting a single NOx emission standard for all turbines may prove difficult because of the high variability in uncontrolled NOx emission levels from different turbine types. It is also unclear whether the NOx emission limits would apply year-round or only during the ozone season. Likewise, it is unclear whether the Department intends to employ a "command and control" approach or more-flexible approaches to achieving emission reduction goals. PSEG Fossil favors strategies that maximize choice and flexibility in determining where best to invest in control technologies to achieve air quality goals. NOx Emissions Averaging and the Acid Rain and NOx Budget Programs have proven the effectiveness of flexible, market-based strategies. A possible approach in this case is to provide a choice between a daily NOx emission allocation and installation of a spe**
Candidate measure 2: Replace all existing aeroderivative turbines with newer Dry-Lo NOx (DLN) based simple cycle turbines Measure ID: DLN technology Emission Reductions: DLN technology based simple cycle turbine can represent over 90% reduction in NOx, compared to existing aero-derivative turbines. Control Cost: Total replacement cost. It ranges from $0.5-0.8 Million per MW. (Ref. Gas Turbine World – 2004) Timing of Implementation: Phase in from 2012 to 2015. Implementation Area: Entire state.	NOx 2009 Reduction: 2009 Remaining: SO2 2009 Reduction: 2009 Remaining: PM 2009 Reduction: 2009 Remaining:	4374 486 N/A N/A N/A N/A	**The recommended phased approach to controlling peaking units is flawed and impractical. Mandating the complete replacement of power generating equipment as an emission control strategy is certainly unprecedented, and the Department's regulatory authority to do so is questionable. The Department should provide further details on how it decided to recommend this measure, which was not identified in the Stationary Combustion Source Workgroup report as one of the top five most promising control measures. The Department did not provide evidence that it assessed the cost and implementation issues associated with this approach. Further analysis is needed, in conjunction with the regulated community, to fully assess actual NOx emission reductions, costs, and other implementation issues.** **From a business standpoint, it is highly unlikely that a source owner would choose to invest in retrofitting a peaking turbine with water injection in 2009 knowing that it could only operate it for 3 to 6 years (i.e. 2012-2015) before it would have to be replaced by a new, DLN-equipped turbine. PSEG Fossil alone has approximately 2,000 MW of peaking capacity. Using the 2004 figures cited by the Department from Gas Turbine World magazine, the replacement cost of this capacity is $1.0 billion to $1.6 billion. In the deregulated power generation market of the Pennsylvania-New Jersey-Maryland Interconnection (PJM) region, there is currently little economic incentive at this time to install new peaking capacity. Market conditions can change, but currently new peaking turbines cannot earn enough net revenues from sales of energy and ancillary services to cover their fixed construction costs and provide a desirable rate of return to investors. So it is highly uncertain whether the desired investments in new peaking capacity would actually occur.**
Policy Recommendation of State/Workgroup Lead: Adopt rules requiring water injection on all peaking units on short term basis (55% NOx reduction by 2009) and replacing all existing peaking units with DLN technology based simple cycle turbines or equivalent (>90% NOx reduction by 2015, phasing in from 2012 to 2015.			**Instead, source owners will likely opt to retire a significant amount of peaking capacity, particularly turbines with extremely low capacity factors for which emissions controls prove cost-prohibitive. Peaking units serve several important functions. In addition to providing electricity during peak demand periods, they also have quick start capability that assists in grid stabilization and congestion management. Any control strategy should consider the impact of the relatively abrupt loss of significant amounts of peaking capacity on system reliability.**
Brief Rationale for Recommended Strategy: Peaking units are generally the last units dispatched during periods of peak load when electrical demand is the highest. The quick start capability of these peaking units assists in grid stabilization and helps address local electrical demand. The operation of older simple cycle turbines is less efficient and, therefore, produces higher rates of pollutant emissions per unit of energy produced. Simple cycle peaking units operate primarily or hot summer days when exceedances of the ozone NAAQS also occur. On such days, these units may account for a substantial fraction of stationary combustion NOx emissions. Due to their significant potential for NOx reduction and corresponding effect on ozone non-attainment, this short term and long term strategy is strongly recommended. According to NJ's estimate, water injection has the promise of reducing 40 tons of NOx per ozone season day in NJ alone. Please note that NJ has over 40 simple cycle aeroderivative turbines, equipped with water injection technology. There are about 80 more simple cycle turbines, which are not equipped with water injection technology. A downside of this method of NOx reduction is the equivalent amount of higher CO emissions proc			**The candidate NOx control measures presented in this whitepaper are inconsistent with, and go well beyond, those presented in the Stationary Combustion Source Workgroup report, "A Collaborative Report Presenting Air Quality Strategies for Further Consideration by the State of New Jersey" dated October 31, 2005. As stated in the report, Candidate Measure 2, complete replacement of all existing aeroderivative turbines with DLN based simple-cycle turbines, is not even identified as one of the top five most promising control strategies. Also, the installation of water injection was cited in the report as a promising technology, but with the caveat that the costs for implementing such a strategy can vary significantly based on a turbine's baseline NOx emissions, utilization level, and other site-specific factors such as existing DM water storage capacity.** **The Workgroup also presented other alternatives, in the category of "Operational Flexibility" that are no or low cost methods the Department could employ to promote the use of newer, more efficient turbines over older units. The Department should not abandon efforts to implement these viable, cost-effective emission reduction strategies.**